Høgskolen i Telemark

Fakultet for allmennvitenskapelige fag

EKSAMEN

Molecular Genetics 4326

06.11.2013

Time: 4 hours

Language: English

No of pages: 2 (12 questions)

Aids: None

Remarks: All the questions have equal value. You may answer in English or in Norwegian

Attachement: None

The result will be on StudentWeb.

English

1. Describe sex-determination in:

   a. Humans
   b. Birds
   c. Fruit flies
   d. Crocodiles

   What is the sex of:
   e. A fruitfly with one X chromosome and no Y chromosomes
   f. A fruitfly with one X chromosome and two Y chromosomes
   g. A fruitfly with two X chromosomes and no Y chromosomes
   h. A fruitfly with two X chromosomes and two Y chromosomes
   i. A human with one X chromosome and two Y chromosomes
   j. A human with one X chromosome and no Y chromosome
   k. A human with three X chromosomes.

   Assume that all individuals have a normal number of autosomes.

2. Describe the four basic types of chromosome rearrangement and their typical phenotypic and genetic consequences.

3. Define the following terms:

   - Haploid
   - Triploid
   - Tetraploid
   - Allotetraploid
   - Autotetraploid
   - Aneuploid

   What are the consequences of triploidy, allotetraploidy and autotetraploidy for fertility?

   What is the usual consequence of aneuploidy in humans?

4. In basilisks, three behavioral characteristics, Aggressive (A), Bloody-minded (B) and Destructive (D) are linked on chromosome 2.

   (a) An aggressive, bloody-minded destructive basilisk was mated with a non-aggressive, non-bloody minded, non-destructive basilisk. All the progeny were aggressive, bloody-minded and destructive.
   (b) These progeny were mated with non-aggressive, non-bloody-minded, non-destructive basilisks and the progeny's behavior was assessed. The following results were obtained.

Aggressive, bloody-minded, destructive	37
non-aggressive, non-bloody-minded, non-destructive	40
Agressive, non-bloody-minded, non-destructive	15
non-aggressive, **bloody-minded, destructive**	16
Agressive, non-bloody-minded, **destructive**	21
non-aggressive, **bloody-minded**, non-destructive	23
Aggressive, bloody-minded, non-destructive	3
non-aggressive, non-bloody-minded, **destructive**	4
Total progeny	159

   What is the order of the genes on the chromosome? What are the dominant and recessive characteristics? What was the genotype of the parents in (a) and the progeny in (b)?

5. Describe rho-independent termination in bacteria.

6. Describe a bacterial promoter including locations of consensus sequences. What is the purpose of the promoter?

7. Mature eukaryotic mRNA is produced when pre-mRNA is transcribed and undergoes several types of processing. Describe the steps (short answers).

8. Which components are required for protein synthesis in bacterial cells?

   Hint:

Stage	**Component**	**Function**
Binding of amino acids to tRNA	Amino acids	Building blocks of proteins ....

9. Briefly describe the structure of chromatin and give three examples of variation in characteristics between euchromatin and heterochromatin.

10. What is the definition of a mutation, and explain what kind of phenotypic effects base substitution mutations can cause.

11. What is a cloning vector? Name three characteristics of an effective cloning vector?

12. What are epigenetics and briefly describe the three major molecular processes that lead to epigenetic changes.